APPLICATION NOTE

Infrared Receiver ICs ATA2525/ATA2526 for Use in IR Receiver Module Applications

SELECTION GUIDE ATA2525/ATA2526

Introduction

The technical requirements of IR receiver ICs are quite high and differ depending on the application. Most available IR receiver ICs provide proper operation in dark ambient environments. If the application needs to operate in bright light or a disturbed environment (for example, inverter lamps or fluorescent lamps), the available IR receiver ICs show great differences regarding their performance and reliability.

Atmel provides a complete family of IR receiver ICs for use in receiver modules. Most important to achieve the best performance (for example, the highest reachable transmission distance under all environmental conditions) is the selection of the correct IR receiver type for the data transmission protocol used. Using the wrong IC type for a given data transmission protocol will result in poor performance and transmission distance.

This IR receiver selection guide will help you to select the best ATA2525/ATA2526 type for your specific application.

For information about IR receiver ICs T2525/T2526, please refer to their dedicated selection guide.

1. Selection Process

1.1 Step 1: Supply Voltage

The different IR receivers operate at different supply voltages. Table 1-1 shows the receiver types and the recommended operating voltages.

Table 1-1. Supply Voltage of IR Receiver Types

Type	Supply Voltage V_S [V]
ATA2525Rxxx	4.5 to 5.5
ATA2526Pxxx	2.7 to 3.3 and 4.5 to 5.5

1.2 Step 2: Carrier Frequency

Each IR receiver IC circuit is adjusted to a carrier frequency by a special fusing procedure (zapping). This takes place during wafer probe. Best performance is obtained by adjusting each IR receiver IC to the transmitter carrier frequency used.

Table 1-2. Available Carrier Frequency

Type	Carrier Frequency f_0 [kHz]
ATA2525Rx33/ATA2526Px33	33
ATA2525Rx36/ATA2526Px36	36
ATA2525Rx38/ATA2526Px38	38
ATA2525Rx40/ATA2526Px40	40
ATA2526Px56	56

1.3 Step 3: Decoding and Disturbance Suppression Type

A further challenge is to find a good compromise between optimum disturbance suppression for all kinds of noise, and maximum efficiency regarding IR code reception.

For this reason, Atmel provides different IR receiver ICs.

Table 1-3 on page 3 provides a cross reference between often-used IR codes and Atmel's recommended IR receiver type.

Table 1-3. Cross Reference: IR Codes to IR Receiver Type

IR Receiver Type	ATA2525R/ATA2526P		ATA2525R	ATA2526P
IR Code	1xx	3xx	5xx	7xx
	Standard	Lamp	Noise	Short Burst
Grundig® code	♦	♦♦	♦	♦
NEC® code	♦	♦♦	♦	♦
RC5 code	♦	♦♦	♦	♦
RC6 code	♦♦	♦	◊	♦
RCMM code	♦♦	◊	◊	♦♦
RCS-80 code	◊	◊	◊	♦
R-2000 code	♦	♦♦	♦	♦
RCA code	♦	♦♦	♦	♦
Sharp® code	♦	♦♦	♦	♦
Sony® 12-bit code	♦	♦♦	♦	♦
Sony 15-bit code	♦♦	♦	◊	♦
Sony 20-bit code	♦♦	◊	◊	♦
Zenith® code	♦	♦♦	♦	♦
High data rate code	◊	◊	◊	♦
Disturbance suppression	♦♦	♦♦+	♦♦+	♦

Note: ♦♦: Best for this application; ♦: Suitable for this IR code; ◊: Not recommended

If the protocol used is in Table 1-3, the selection process is finished!

If the protocol used is not listed in the cross reference (Table 1-3), it is necessary to know the exact waveform of the IR signal for the application. Table 1-4 shows the boundary conditions for the different IR receiver versions depending on the transmitted protocol characteristics.

Figure 1-1 on page 4 shows a typical remote control signal. A certain number of pulses of the carrier frequency is called a burst. A command word consists typically of several bursts and the gaps between the bursts. Two command words are separated by a pause time. With your measured timing it is easy to choose the best IR receiver type.

For calculation examples, see “Appendix” on page 7.

Table 1-4. Infrared Code Characteristics and the Suitable Receiver Type

IR Receiver Type	T2525R/ATA2526P		T2525R	ATA2526P
IR Code	1xx	3xx	5xx	7xx
	Standard	Lamp	Noise	Short Burst
Minimum burst length t_{burst} [number of pulses per burst]	10 pulses	10 pulses	10 pulses	6 pulses
Minimum gap time t_{gap} [number of pulses per pause] between two bursts	14 pulses	14 pulses	14 pulses	10 pulses
Minimum data pause time t_{pause} if a burst is longer than 1.8ms (e.g., preburst $t_{preburst}$)	1 times burst length	4 times burst length	6 times burst length	1 times burst length

Figure 1-1. Typical IR Signal

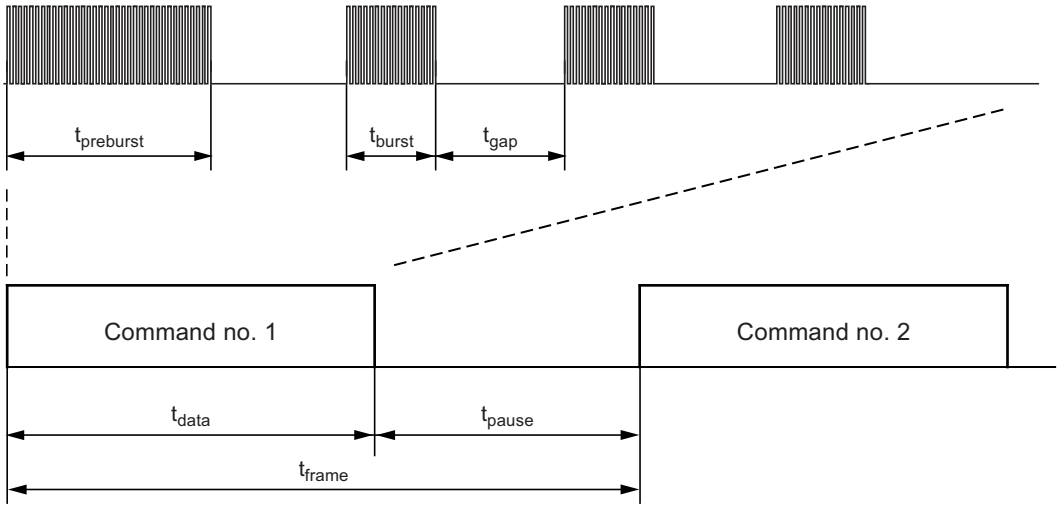


Figure 1-2. IR-code-based Selection Flow

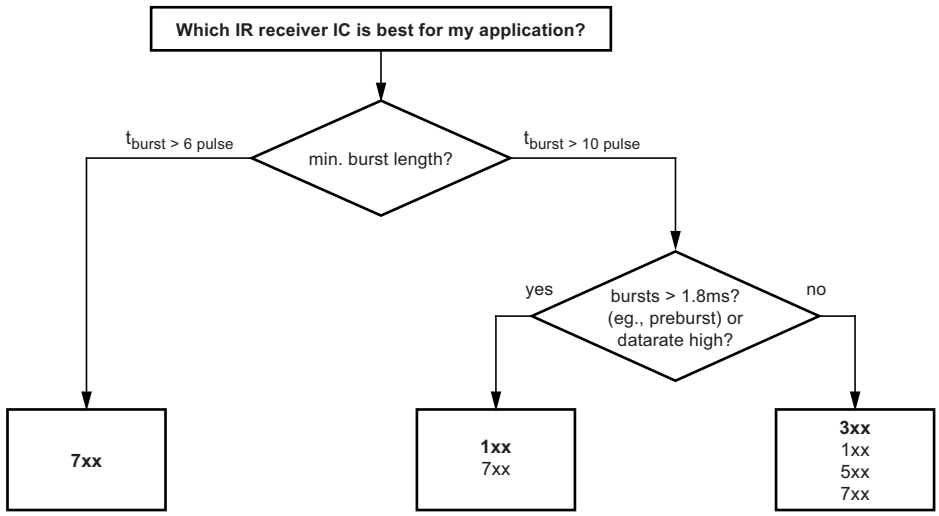


Table 1-5. Overview of the Disturbance Suppression Behavior

IR Receiver Type	ATA2525R/ATA2526P		ATA2525R	ATA2526P
IR Code	1xx	3xx	5xx	7xx
	Standard	Lamp	Noise	Short Burst
Most standard fluorescent lamps (with switched supply)	♦♦	♦♦	♦♦	♦♦
Most standard fluorescent lamps (with direct line supply)	♦♦	♦♦	♦	♦
Rarely used fluorescent lamps (with strong ballast)	◊	♦♦	♦♦	◊

Note: ♦♦: Best suppression; ♦: suppression in most cases; ◊: possibility of disturbance pulses

The selection diagram Figure 1-2 on page 4 illustrates the selection flow for each application. This flow is based on the IR protocol of the application. Therefore, a measurement of the IR code to be used has to be done if the timing information is unknown.

1.4 Disturbance and Noise Aspects

Using both the cross reference (Table 1-3 on page 3) and the selection flow diagram (Figure 1-2 on page 4) enables you to select the best IR receiver IC with regards to transmission and disturbance suppression.

Table 1-5 shows the disturbance and noise suppression behavior of different IR receivers.

Note: Not all IR receivers support all known IR remote control protocols (see Table 1-3 on page 3).

2. Key Features of the Different IR Receiver Types

2.1 1xx Standard Type

- High disturbance suppression
- Best compromise between the number of transmittable IR codes and disturbance suppression
- Suitable for protocols with a minimum burst length of > 10 pulses per burst
- Supports most IR codes (see Table 1-3 on page 3)

2.2 3xx Lamp Type

- Enhanced disturbance suppression
- Suitable for protocols with a minimum burst length of > 10 pulses per burst
- Supports a lot of IR codes (see Table 1-3 on page 3)

2.3 5xx Noise Type

- Enhanced disturbance suppression
- Suitable for protocols with a minimum burst length of > 10 pulses per burst
- Does not support all IR codes (see Table 1-3 on page 3)
- Special type, available on request

2.4 7xx Short-burst Type

- High disturbance suppression
- Suitable for protocols with a minimum burst length of > 6 pulses per burst
- Supports most IR codes (see Table 1-3 on page 3)
- High data rate — up to 4000 bits/s

3. Glossary and Abbreviations

f_0	Carrier frequency for best receiver sensitivity
IN	Input pad
GND	Ground pad
OUT	Output pad
kHz	Kilohertz
ms	Milliseconds
pulse length	$1 / f_0$ [ms]
$t_{preburst}$	Length of a preburst in pulses of the carrier frequency or in [ms]
t_{burst}	Length of a burst in pulses of the carrier frequency or in [ms]
t_{gap}	Length of the gap between two bursts in pulses of the carrier
t_{data}	Length of the command word
t_{pause}	Length of the pause between two command words
t_{frame}	Frame time $t_{frame} = t_{data} + t_{pause}$
t_0	Length of one pulse of the carrier frequency in milliseconds ($1 / f_0$)
VDD, VS	Positive supply voltage pad

4. Appendix

4.1 Selection Example

Customer specification:

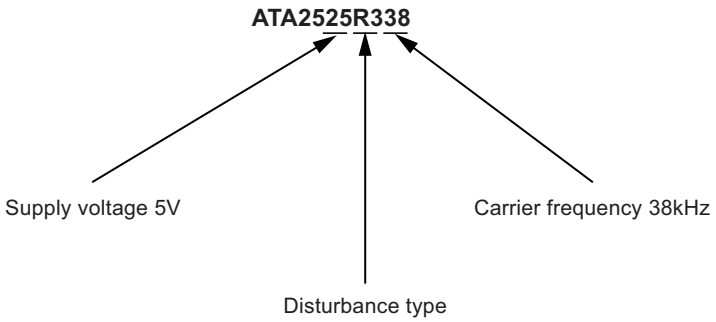
Power supply V_S = 5V, IR code RC-5, carrier 38kHz.

Step 1: Supply voltage: 5V → T2525Rxxx

Step 2: Carrier frequency: 38 kHz → T2525Rx38

Step 3: Decoding type: best choice in cross reference list lamp type → ATA2525R3xx

Figure 4-1. Selection Result of Steps 1 to 3



Note: The ATA2525R138 is also applicable but the ATA2525R338 provides the best disturbance suppression in this case.

4.2 Calculation Example

Customer specification:

Power supply V_S = 3.3V, IR code ?, carrier ? kHz

Step 1: Supply voltage: 3.3V → ATA2526Pxxx

Step 2: Carrier frequency measurement: pulse length t_0 = 0.025ms → f_0 = 40kHz → ATA2526Px40

Step 3: Decoding type: $t_{preburst}$ = 4 ms, t_{burst} = 0.6 to 1.2ms (24 to 48 t_0), t_{gap} = 0.6ms (24 t_0) using Figure 4-1, Figure 4-2 and Figure 4-3 on page 8 → ATA2526P1

Figure 4-2. IR Signal

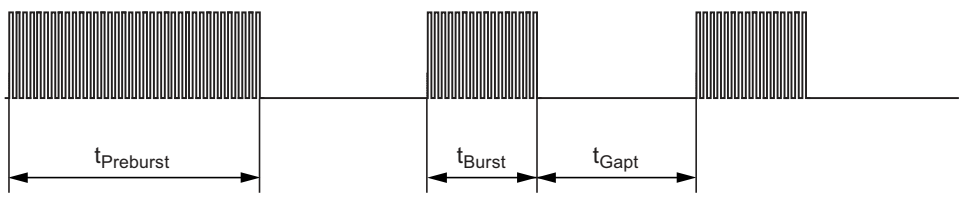
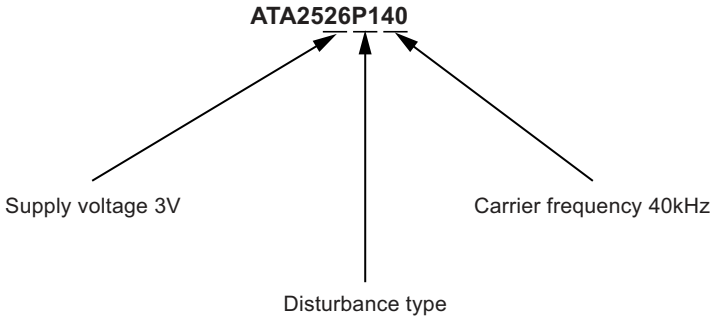


Figure 4-3. Calculation Result of Steps 1 to 3



1. The ATA2526P740 is also applicable, but the ATA2526P140 provides a better disturbance suppression in this case.

5. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	History
4895E-AUTO-07/15	• Put document in the latest template
4895D-AUTO-06/08	• Put document in the latest template • Table 2-3 “Cross Reference: IR Codes to IR Receiver Type” on page 3 updated • Table 2-4 “Infrared Code Characteristics and the Suitable Receiver Type” on page 3 updated • Figure 2-2 “IR-code-based Selection Flow” on page 4 updated • Section 3.3 “5xx Noise Type” on page 6 updated • Section 5.1 “Selection Example” on page 8 updated

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